

Progress Report

A. Project Identifiers:

- 1) Award Number: NA17FX1422
- 2) Grant Program: SSLRI Program
- 3) Name of Recipient Organization: University of Washington
- 4) Principal Investigator: Dr. Glenn R. VanBlaricom
- 5) Project Title: Nutritional significance of ephemeral high-quality foraging opportunities for Steller sea lions.
- 6) Funding: US\$573,712.00
- 7) Award Period: 1 October 2001 – 30 September 2004
- 8) Period covered by this report: 1 October 2001 – 31 March 2002

B. Project Summary

The two populations of Steller sea lions (*Eumetopias jubatus*) recognized in Alaska (eastern and western—divided at 144 degrees west) are undergoing different rates of change. The western population has been declining since the 1970's while the eastern population remains stable. One of the primary hypotheses for the decline of the western animals is a change in the availability of prey species. Sand lance (*Ammodytes hexapterus*), herring (*Clupea pallasii*), capelin (*Mallotus villosus*) and eulachon (*Thaleichthys pacificus*) are high quality prey species (high lipid and energy content) that may only be available to sea lions during their respective spawning seasons. Consumption of high-quality forage fish during the ephemeral period of availability may specifically influence individual and interregional variations in juvenile survival rate and adult reproductive fitness.

Fish species have unique fatty acid signatures that can be identified using gas chromatography (GC). When pinnipeds ingest prey, most of the long chain fatty acids from the prey enter their blubber unmodified. Thus, if the signature of a prey species is known, it can be identified and quantified, if present, in sea lion blubber. GCxGC, a new technique for the quantification of fatty acids present in lipid samples, will be compared with traditional GC as part of this study. This project will pursue three primary tasks: 1) Assessment of within-region geographic variation in fatty acid signatures of forage species known to be high in mass-specific energy, but ephemeral in availability as prey for Steller sea lions. Assessments will be done in the ranges of both western and eastern sea lion populations; 2) Use of captive sea lions to determine fluctuations in fatty acid profiles of sea lion blubber in response to brief periods of availability of prey with high energy densities, and 3) Preliminary assessment of the presence of fatty acid signatures of ephemeral, high-quality prey in free-ranging Steller sea lion blubber in both western and eastern populations and evaluation of their relative contribution to blubber stores and diet.

C. Summary of Progress and Results to Date (by Study Objective)

Objective 1: Assess within-region intersite variation in fatty acid profiles, by prey species, for eulachon, herring, sand lance, and capelin in the ranges of the western and eastern populations of Steller sea lions.

Scheduled tasks:

Complete detailed planning for fish sampling and handling protocols.

A permit was obtained from the Alaska Department of Fish and Game (ADFG) to sample adequate amounts of eulachon, capelin, herring and sand lance for the years 2001 and 2002. Approval was granted from the UW Institutional Animal Care and Use Committee for collection of these fish species. Sampling sites were chosen and numbers of fish to be collected was determined.

Obtain all supplies and equipment necessary for fish sample collection, handling, and analyses.

Equipment was purchased for the storage of fish (-20 freezer, coolers, bags, labels, sample vials, chloroform and BHT).

One visit was made to the laboratory of Dr. Sara Iverson at Dalhousie University to learn lipid extraction, fatty acid methyl ester preparation, and fatty acid analysis techniques. Initial equipment purchasing was done to set up the laboratory of Dr. Glenn VanBlaricom at the University of Washington (UW) to utilize these techniques.

Complete all planning and necessary contractual arrangements for travel and transport to and from study areas, and logistical arrangements associated with use of inflatable skiffs for sampling in the field.

Primary field researchers (Litzky and VanBlaricom) completed a boat operation and safety course required by the UW School of Aquatic and Fishery Sciences. The original intention was to collect Steller sea lion prey items while in the field obtaining sea lion blubber biopsies, in order to sample ephemeral foraging events while they were occurring. However, as a National Marine Fisheries Service (NMFS) Marine Mammal Research Permit has not yet been granted (see details below) we did not feel the cost of chartering vessels solely for the purpose of fish collections could be justified. Thus, contacts were made with employees from the ADFG, the United States Geological Survey, NMFS, and the University of Alaska to help facilitate the collection of fish.

Fish Collections:

Plans were made for the year 2002 collection of spawning herring from 3 locations in southeast Alaska (SEAK), 2 locations in Prince William Sound (PWS), 1 location in lower Cook Inlet, 3 locations around Kodiak Island, and 5 locations in the Aleutian Islands (AI).

Plans were made for the year 2002 collection of spawning eulachon from 4 locations in SEAK, 3 locations in PWS, 3 locations around Kodiak Island, and 5 locations in the AI.

Plans were made for the year 2002 collection of capelin and sand lance from 1 location in PWS, 3 locations around Kodiak Island, and 5 locations in the AI.

Plans were made for the year 2002 of other potential Steller sea lion prey items from 1 location in PWS, and 5 locations in the AI.

Field sampling of sand lance as available.

Sampling of sand lance in the winter of 2001 was not feasible due to poor weather conditions (heavy ice year) and inadequate preparation time.

Preparation of sampled sand lance for fatty acid analyses, up to the point of aliquot storage in chloroform/BHT.

See above.

Objective 2: Measure the appearance, quantitative contribution to, and persistence of fatty acid signatures of ephemeral, high-quality prey species in the fatty acid profiles of blubber samples taken from captive sea lions.

Scheduled tasks:

Initiate planning for studies of captive animals in collaboration with research, veterinary, and husbandry staffs of the Vancouver Aquarium and the Alaska Sea Life Center.

Visits were made to both the Vancouver Aquarium (VA) and the Alaska Sea Life Center (ASLC). Consultations were made with veterinarians to ensure proper techniques will be used for the collection of blubber biopsies. Details of the feeding trials were discussed and timing of the events coordinated with research and husbandry staff from each facility. All animals are currently engaged in other research projects, but will be available for use in our study as follows:

VA is currently undergoing a major construction project in the area where Steller sea lion research is conducted. If animals are able to participate in research during the construction some animals may be available for feeding trials as early as September 2002. If animals can not participate in research during the construction, the feeding trials for this project will be delayed until April 2003.

ASLC is currently waiting for approval of modifications made to their existing NMFS Marine Mammal Scientific Research Permit (which expires March 2003) allowing for an increased number of blubber biopsies to be taken from their animals. If approval is granted, feeding trials for this project could begin as early as September 2002. If approval is not granted before expiration of the existing permit, our research will be included in their new Scientific Research Permit and feeding trials will begin in March 2003.

Complete all planning and necessary contractual arrangements for studies with captive animals at the Vancouver Aquarium and the Alaska Sea Life Center.

Approval has been granted from the UW and the University of British Columbia (associated with the VA) Institutional Animal Care and Use Committees (IACUC) for work with the captive animals at the two facilities. An application is currently being submitted for approval from the ASLC IACUC. All studies at the VA are approved through the Canadian government. Studies at the ASLC are pending NMFS approval (see above). Additionally, an application for a NMFS permit to allow transport of the samples from Canada and Alaska to the UW is currently being submitted.

Objective 3: Measure the quantitative contribution to fatty acid signatures and diet of ephemeral high-quality foraging opportunities in blubber stores of free ranging Steller sea lions in both eastern and western populations.

Scheduled tasks:

Complete all planning and necessary contractual arrangements for travel and transport to and from study areas, and logistical arrangements associated with use of inflatable skiffs for sampling in the field.

Consultations with the UW Grants and Contracts office were conducted to ensure all appropriate information was obtained for chartering boats in the study area. Contracts were discussed with a number of charter boat captains; however, no details could be solidified due to lack of a Scientific Research Permit (see below).

Initiate planning for biopsy sampling of free ranging sea lions in collaboration with biologists with the Alaska Department of Fish and Game, the National Marine Fisheries Service, and the University of Alaska.

Meetings were held with researchers from ADFG and NMFS who are conducting live captures of Steller sea lions. Blubber biopsies are being collected during this work but timing of sampling is not correlated with spring runs of forage fish. Thus, we will be required to conduct our own sampling on free ranging animals. Researchers from both agencies agreed to share the results from their fatty acid work as a baseline (non-ephemeral foraging event blubber) for this study. They also agreed to supply the UW laboratory with any excess fatty acids from their work for use in validating the GCxGC technique.

Two cross-bows have been purchased for the biopsy work on free ranging animals and manufacturing of special biopsy darts for Steller sea lion blubber collection has begun. A trip was made to the California Marine Mammal Center to shoot prototype darts at California sea lion carcasses. Researchers have been practicing with the cross-bows to attain appropriate accuracy.

Complete all planning and necessary contractual arrangements for biopsy sampling of free ranging sea lions.

On 12 September 2001 an application for a NMFS Marine Mammal Scientific Research Permit was submitted to the Office of Protected Resources. This application requests a permit that will allow the sampling of 100 animals each from the eastern and western Steller sea lion stocks per year via remote biopsy darts fired from a cross-bow. Approval of this permit is still pending.

D. Problems (including how it might affect budget):

Due to the number of requests for Steller sea lion research permits last year, NMFS was required to conduct an Environmental Assessment (EA) of all proposed activities. No new permits can be issued until a "Finding of No Significant Impact" is reached or a full Environmental Impact Statement is compiled. Thus, blubber samples of free ranging Steller sea lions foraging on spring runs of eulachon, capelin, herring and sand lance will not be collected for 2002. This will reduce the number of field seasons that can include sea lion sampling by one. If three field seasons of sea lion sampling are required, funding for this project will need to be increased and extended to cover the 2005 fiscal year.

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